

16.—Remains of a thylacine (Marsupialia : Dasyuroidea) and other fauna from caves in the Cape Range, Western Australia

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Abstract.

Occurrences of thylacine and other vertebrate remains from cave deposits in the Cape Range are reported. Some of these records appear to lie outside the known modern distributions of the species. Aboriginal shell artefacts are also reported from one of the sites.

Introduction

Between 1960 and 1970, several collections of animal remains from cave deposits in the Cape Range, Western Australia (Figs 1 and 2), were presented to the Western Australian Museum. This material has now been analysed. In naming mammals, we follow Ride (1970).

Cave reference numbers, for example CR 4, are those of the Western Australian Speleological Group (W.A.S.G.) and should not be confused with the deep wells (Cape Range 1 to 4) drilled in the area by West Australian Petroleum Pty. Ltd.

The geology of the Cape Range district has been described by Condon et al. (1955). The caves occur in gently folded marine limestones of Miocene age. Maps of the region include the Ningaloo (SF 49-12), Onslow (SF 50-5), and Yanrey (SF 50-9) sheets, Australia, 1:250,000 series.

The specimens, on which this report is based, are Western Australian Museum fossil vertebrates 62.9.1-22, 66.4.17-84, 67.7.2, 68.5.28-32, 68.7.53 and 68.7.54, 68.7.56-111, 69.6.403, 69.7.411-431, 69.7.757-762, 71.6.44, 71.6.56-157, 71.7.121, 71.9.1-4, 71.10.197-207; fossil invertebrates (land snails) 71.996-998, 71.1003-1008. The numbers of zoological and archaeological specimens are cited in the text.

History of collecting

The earliest collections known to us from cave deposits in the Cape Range were made in April 1962 by Messrs. D. L. Cook and T. Fry, both members of the Western Australian Speleological Group (W.A.S.G.). Cook (1962) reported on the results of the visit. Two of their localities, Owl Roost Cave (CR 4) and Cave CR 7, are represented by Samples 1 and 2 in Table 1, which reidentifies several of their specimens.

In August 1962, Messrs. P. Cawthorn (Western Australian Museum) and P. Symons (W.A.S.G.) collected fossils from Owl Roost Cave (CR 4), from Caves CR 43, CR 44 and four other caves, listed as Samples 3 to 9, Table 1. Of these seven caves, only the location of Owl Roost Cave is known with confidence and two others, CR 43 and CR 44 are known approximately.

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The other four have not yet been allocated reference numbers because of uncertainty as to their location. Cawthorn (1953) reported on zoological collecting in the district but not on cave deposits.

In May 1965, a Western Australian Museum party comprising Mr and Mrs G. E. J. Hitchin and G. W. Kendrick collected from five fossiliferous sites, Caves CR 18, CR 19, CR 6, CR 20 and Monajee Cave (CR 21) listed under Samples 10 to 14, Table 1. For part of the time, they were assisted by Messrs A. J. Saar (W.A.S.G.) and D. G. Bathgate (Honorary Associate, Western Australian Museum), Mrs E. F. Saar and Mr T. Butler. A short account of the expedition was prepared by Kendrick (1968).

In April 1966, Mr D. G. Bathgate collected from Cave CR 42. This material is listed as Sample 15, Table 1.

In April 1968, Mr P. J. Bridge and eight other members of the W.A.S.G. collected fossils from Caves CR 29, probably CR 36 and from Owl Roost Cave (CR 4), listed under Samples 16 to 18, Table 1. An account of the expedition was prepared by Bridge (1968).

Localities

The following locality details of known fossiliferous caves in the Cape Range have been compiled from field records and catalogue entries relating to specimens in the fossil collection of the Western Australian Museum, from published reports of field parties (Cook 1962; Kendrick 1968; Bridge 1968) and from information kindly provided by Mr P. J. Bridge.

1. Owl Roost Cave, CR 4. The name was first used by Cook (1962). The location is approximately 15 km from Learmonth along the track to the Cape Range No. 3 deep well. The sink hole, about 3 m in diameter, lies about 30 m east from the track and is marked by a fig tree (*Ficus platypoda* Hook.). The chamber beneath the solution pipe contained owl pellet remains and bones of larger animals. In our records, three different parties have collected from this cave.

2. Cave CR 7. The location is near Central Hill beside the track from Learmonth to the Cape Range No. 4 deep well and approximately 9 km south of the fork in the track which leads away to the No. 3 deep well. The cave was "a single cavern with a rectangular entrance halfway up a cliff on the west side of the track" (Cook 1962).

3. Unregistered cave, Sample 3, Table 1. On original labels, the location is described as "Soln.



Figure 1.—Locality map: Australia.

pipe and cave 70' deep 130 yards S of No. 3 track, at 7.9 mls". We assume this to mean 7.9 miles (12.7 km) from Learmonth along the track to the Cape Range No. 3 deep well.

4. Unregistered cave, Sample 4, Table 1. On original labels, the location is described as "Sinkhole and cave 8 yards W of No. 3 track at 7.3 mls". We assume this to mean 7.3 miles (11.8 km) from Learmonth along the track to the Cape Range No. 3 deep well.

5. Unregistered cave, Sample 5, Table 1. On original labels, the locality is described as "Soln. pipc 100' deep, 1½ mls NE of No. 2 well".

6. Unregistered cave, Sample 6, Table 1. On original labels, the location is described as "Sinkhole 120' deep, 100 yards W of Learmonth road at 7.4 mls". We assume this to mean 7.4

miles (11.9 km) from Learmonth along the track to the Cape Range Nos. 3 and 4 deep wells. The track forks, northward to the No. 3 well and southward to the No. 4 well within a few kilometres from the position of this cave.

7. Cave CR 43. On original labels, the location is described as "Sinkhole and undercut 2/3 ml. N of Mt. King".

8. Cave CR 44. On original labels, the location is described as "Small cave near Bunbury Cave, 5 ml bore, Yardie Creek Station".

9. Cave CR 18 (in field notes, WAM Cave 1). The location is 1.0 km and bearing 354° from the Cape Range No. 2 deep well. At the surface, the cave had a large, undercut collapse opening, into which a gully would discharge water after rain. The cave floor lay about 40 m below the

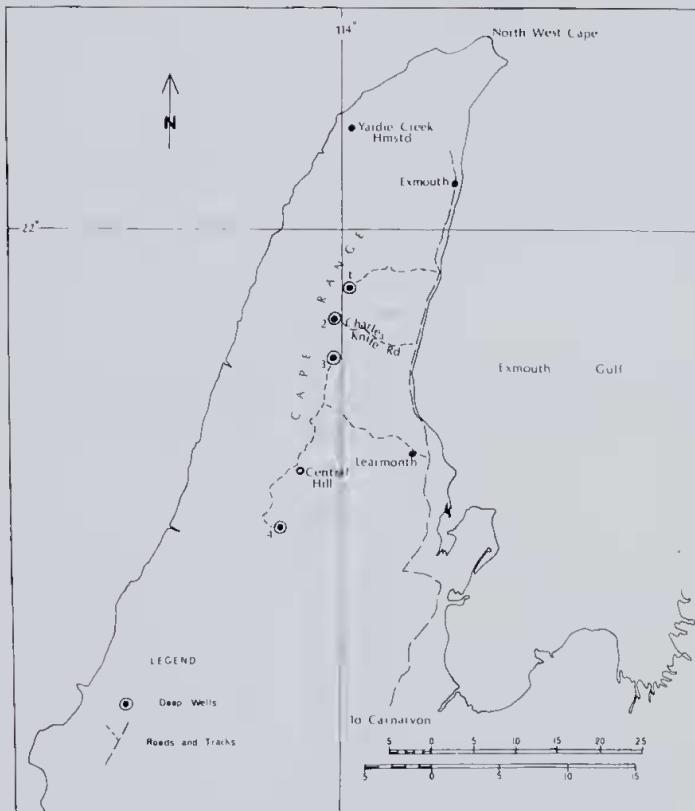


Figure 2.—Locality map: Cape Range. Bar scales in km (upper) and miles (lower).

surface, rising to the west and descending to the east within a large chamber. A few minor "cave earths", probably water deposited, were sampled from along the sides of the chamber but, apart from a single skull picked up from the floor, no vertebrate remains were found. Located from aerial photographs, this cave attracted attention because of its large size but it proved to be a very poor fossil site.

10. Cave CR 19 (in field notes, WAM Cave 3). The location is 0.7 km and bearing 38.5° from the Cape Range No. 2 deep well. A sinkhole about 3 m wide at the surface descended to a rubble floor at a depth of 19.5 m. A side passage continued down beneath a wedged boulder; about 3.6 m further below was a small chamber with a descending, spiral passage leading down about a further 4 m, and floored with bone-rich rubble and sand. The lowest part of the cave was the richest in bone material.

11. Cave CR 6 (in field notes, WAM Cave 4). This cave was noted but not entered by Cook and Fry (Cook 1962). The location is close to the eastern side of the track from Learmonth to the Cape Range No. 4 deep well, about 21 km from Learmonth. A solution pipe, about 3 m wide at the surface, widened considerably below ground, passing down to a chamber with a rubble floor and a sand deposit at a depth of 30 m. A bone-rich "cave earth" was found in a lower part of the chamber floor. Earthworms collected from humic soil in this chamber have been described by Jamieson (1971). Insects and other arthropods were seen but not collected.

12. Cave CR 8 (in field notes, WAM Cave

5). The location is about 3 km west of Learmonth on the escarpment of the Cape Range and a little south of Charles Knife Road. Cook (1962) described it as "An open, well-illuminated single chamber containing much weathered calcite formation. It is situated in the base of a cliff and has apparently been exposed after a collapse of a section of the cliff". Poorly fossiliferous "cave earths" were sampled by Hitchin and Kendrick in 1965. This cave was listed under the reference number CR 20 by Kendrick (1968).

13. Monajee Cave, CR 21 (in field notes, WAM Cave 6). The name was first used by Kendrick (1968). The location is 3.6 km and bearing 46° from Central Hill. The cave entrance, an open sinkhole about 2 m wide at the surface, lay within a small depression on a ridge of rocky, broken ground. A large fig tree covered the opening. The cave is discussed in further detail below in connection with the discovery there of thylacine remains.

14. Cave CR 42. The location is in a canyon 1.6 km north east of the Cape Range No. 2 deep well. It is described as "a small cave".

15. Bell Cave, CR 29. The name was first used by Bridge (1968), who describes the location as "Airphoto 5297, Ref. 5.9 cm S and 6.7 cm E of the photo centre point". The cave is a bell-shaped hole 20 m deep, with two surface openings. At the bottom, a horizontal tunnel leads off for a short distance.

16. Cave CR ?36. There is some uncertainty as to whether the fossil material came from this cave or from CR 41, but Mr P. J. Bridge (personal communication, January 1972) considers that the source was more likely to have been CR 36. The location is approximately 2.9 km beyond the fork in the track from Learmonth, proceeding toward the Cape Range No. 3 deep well. It is close to the eastern side of the track. Cave CR 41 is located about 0.4 km south east of Cave CR 36 and about 0.2 km east of the track.

Thylacine and associated remains from Monajee Cave (CR 21)

One of the caves located by the 1965 Museum expedition, initially referred to in field records as WAM Cave 6, was subsequently named Monajee Cave, for reasons which are discussed below. The name is derived from the Aboriginal word for "conch shells used as utensils" in the Gascoyne-Ashburton districts and was obtained from the manuscripts of Mrs Daisy Bates by Dr I. M. Crawford of the Western Australian Museum (Kendrick 1968).

Monajee Cave comprised a more or less vertical but somewhat twisted solution pipe about 2 m wide and 21 m deep, which opened into a chamber a further 3 m deep and about 10 m across at the widest part. The total depth from surface to floor was 24 m. Fig tree roots covered much of the walls of the shaft and several of these continued down from the chamber roof into the floor below. The abrupt transition from vertical shaft to laterally developed chamber suggests that the roof of the lower cave lies at or near the contact of the Tulki

Table 1

Vertebrates present in samples from cave deposits of the Cape Range
Numbers in the columns represent the minimum number of individuals represented in each sample

Collectors and Year of Visit	Cook & Fry, 1962	Cawthorn and Symons, 1962	Hitchin, Kendrick et al., 1965	Bathgate 1965	Bridge et al. 1968														
Sample Numbers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Cave Numbers	CR 4	CR 7	CR 4	CR 4	CR 4	CR 4	CR 4	CR 4	CR 4	CR 4	CR 19	CR 6	CR 8	CR 21	CR 42	CR 20	CR ?	CR 4	
MARSUPIALS																			
<i>Dasypus hallucatus</i>	2										1	2		3					1
<i>Antechinus rosamondae</i>											2	1		1					
<i>Antechinus macdonnellensis</i>	2										2	1		2					
? <i>Planigale</i> sp. or ? <i>Spinthopsis</i> sp.	2										1	1		2					
<i>Smithopsis longicaudata</i>											1	1		1					
<i>Saurotopsis</i> sp.											1	1		1					
<i>Phascogale calura</i>											1	1		1					
<i>Thylacinus cynocephalus</i>											1	1		1					
<i>Perameles</i> sp.											1	1		1					
<i>Isodon</i> sp.	7		1								9	8		33					
<i>Trichosurus</i> sp.	1		1								1	2		2					1
<i>Potorous platyops?</i>											1	1		1					
<i>Bettongia lesueur</i>											3	5		16					1
<i>Petrogale</i> sp.		1	2								1	1		9					
<i>Macropus</i> (some identified as <i>robustus</i>)	1										1	1		1					
EUTHERIANS																			
<i>Rattus tunneyi</i>											10	1		7					
<i>Rattus rattus</i>	12		4							1	1	1		2		1			
<i>Mesembriomys macrurus</i>	1		1								1	1		1					
<i>Leporillus apicalis</i>	1		1								1	1		1					
<i>Notomys</i> (<i>Blongicaudatus</i> ? <i>amplus</i>)	1		1								1	1		1					
<i>Notomys</i> sp.	2										1	1		4					
<i>Zyzomys pedunculatus</i>	1		1								1	1		10					
<i>Zyzomys</i> probably <i>pedunculatus</i>	22										27	1		4					
<i>Pseudomys hermannsburgensis</i>	1										1	1		3					
<i>Pseudomys</i> ? <i>praeconis</i>	1										1	1		1					
<i>Pseudomys desertor</i>	1										3	3		3					
<i>Pseudomys nanus</i>	1										2	2		1					
<i>Canis familiaris</i>											1	1		1					
<i>Felis catus</i>											1	1		1					
<i>Oris aris</i>											1	1		1					
OTHER VERTEBRATES																			
Bird	1										2	3		1					
Lizard	?1										1	1		1					
Python											1	1		1					
Shark (teeth)											1	1		1					

Limestone and the Mandu Calcarenite (Cook 1962). A prominent dripstone pillar, no longer growing, descended from the chamber roof and had been sharply truncated about midway between the roof and the present floor of the cave. This probably represented a column, severed by subsidence of the floor on which it had once stood.

Bone-bearing samples were collected from deposits in six different parts of Monajee Cave. One of these was a lithified "cave earth", remnants of which were attached to the limestone walls up to about 1.8 m above the present floor and up to about the same level as the base of the truncated roof pillar. Several large pieces of lithified "cave earth" were found on the floor and the largest of these, from which bones were seen protruding, was collected. The lithified "cave earth" appeared to be the oldest remaining deposit present within the cave.

Unlithified "cave earths" were sampled from other parts of the chamber, including a bank about 1 m high along the eastern wall. Other bone material was gathered from the present floor surface.

When the party returned to Perth, G. E. J. Hitchin used dilute acetic acid to extract a portion of a pelvis from the large block of lithified "cave earth". This was identified as dog (*Canis familiaris*, presumably dingo) and the occurrence recorded by Merrilees (1968), who cited the cave under its informal name of "WAM Cave 6".

In a recent re-examination of the samples collected from Monajee Cave, one of us (J.K.P.) noticed several vertebrae and a single calcaneum representing the thylacine (*Thylacinus cynocephalus*). The vertebrae (No. 71.6.137) came from the same piece of lithified "cave earth" as the dingo pelvis and appeared to be from an animal of small size, the age of which we could not judge. The calcaneum (No. 71.6.103) was found in the bank of unlithified "cave earth" along the eastern side of the chamber and was from the right "heel" of a small but apparently adult animal. The deposit containing the calcaneum appeared to be geologically younger than that from which the vertebrae and the dingo pelvis came but we have no radio metric dates or other means of absolute age determination. The possibility that the calcaneum was reworked from a pre-existing deposit, such as the lithified "cave earth", could not be ruled out.

This record is the first known occurrence of thylacine remains from the north west of Western Australia, though Wright (1968, 1972) has reported Aboriginal rock engravings from the Pilbara region which apparently depict thylacines. It is of interest that the next most northerly occurrence of thylacine remains in this State is also a calcaneum. The specimen (No. 67.11.25) was noticed by Mr J. M. Clark in a sample collected from Weelawadji Cave, Eneabba district, by a Museum party which included Mr and Mrs Hitchin.

Other vertebrates found in association with the thylacine and dog remains in the piece of lithified "cave earth" were a bandicoot (*Isodon* sp.), macropods (*Petrogale* sp. and *Macro-*

pus sp.), a rat (*Rattus* sp.) an unidentified murid and a bird.

Land snail shells were common in all of the deposits sampled in Monajee Cave. Those collected represented species of *Themapupa*, *Australbinula*, *Discocharopa*, *Eremopeas* and *Rhagada*; *Pleuroxia ruga* Cotton (Cotton 1953) and a minute punctid of undetermined genus were also collected. All of the species recovered are probably living in the vicinity of the cave at the present time. A living *Eremopeas* was found in aestivation with epiphragm intact on a ledge in the solution pipe of Monajee Cave about 10 m below the ground surface. This specimen (No. 4677-68) is now in the modern mollusc collection of the Western Australian Museum.

Aboriginal artefacts in Monajee Cave

The modern floor of Monajee Cave was found to be strewn with numerous pieces of large marine shells, mostly fragmentary, but one large specimen was almost entire. Forty eight pieces were picked up from the floor surface and another piece was found in an excavation a few centimetres below the surface. In addition, a piece of shell was found firmly embedded in flowstone on the wall of the chamber at about 0.8 m above the present floor. This specimen was not collected.

The shells from Monajee Cave were sufficiently well preserved to permit identification and represent the gastropod species *Syrinx aruanus* Linnaeus and *Melo amphora* (Solander), both of which are common along the beaches and intertidal shallows along both sides of North West Cape. Shells of these two species were once widely utilized by the Aboriginal people of the region to make utensils (McCarthy 1967) and the shapes of some of the pieces collected indicate that they were fashioned for this purpose. The quantity of shell material recovered from Monajee Cave suggests that, for a long time, the Aboriginal people of the district had made a practice of discarding such objects into the opening of the solution pipe.

These specimens (Nos. A 15913 and A 22117) are now in the archaeological collection of the Western Australian Museum.

Apparent range extensions of mammals

Several of the mammalian occurrences listed in Table 1 imply extensions of range when compared with modern and fossil distributions hitherto recorded. In each case, comparisons were made with modern distributions given by Ride (1970) and with fossil specimens in the collection of the Western Australian Museum. Fossil distributions recorded by Lundelius (1957, 1960) were also taken into account. In assessing these apparent range extensions, it should be kept in mind that the living fauna of the Cape Range is not well known.

Sminthopsis longicaudata is represented by four individuals, two from Owl Roost Cave (CR 4) and two from Monajee Cave (CR 21). This little known species is recorded from the vicinity of Marble Bar and ? Central Australia (Ride 1970) and also from "the Pilbara" and

Marble Bar. Thus all extant and well localized records of this species from Western Australia are from the north eastern part of the Pilbara region, about 600 km east from the Cape Range.

A single specimen representing *Antechinus rosamondae* from Owl Roost Cave (CR 4) appears to be the first fossil record for the species and also suggests a slight extension of range. Ride (1970) records it from the Port Hedland district to Onslow on spinifex grassland. A modern specimen (No. M 6534) collected 20 miles (32 km) south east of Minderoo station homestead, lower Ashburton district, is in the collection of the Western Australian Museum.

Two specimens from Cave CR 19 represent a small phascogaline dasyurid. The material is incomplete but may possibly be either a species of *Planigale* or a known but as yet undescribed dasyurid of uncertain generic status from the Pilbara region.

A single tooth from Cave CR 19 appears to represent *Phascogale calura*. This species has been recorded in historic time from the inland south west of Western Australia, the MacDonnell Range of the Northern Territory and elsewhere in eastern Australia (Ride 1970). Lundelius (1957) recorded fossil specimens from the southern Nullarbor region and subsequently (Lundelius 1960) from "Drover's Cave" (really Hastings Cave) Jurien Bay district (see Merrilees 1968).

For determinations and comments on the above four dasyurid species, we are indebted to Mr M. Archer (personal communication, September, 1971).

A single molar tooth (No. 68.7.102) from Cave CR 6 appears to represent *Potorus platyops* (Butler and Merrilees 1971).

Cook (1962) recorded *Mesembriomys macrurus* from Owl Roost Cave (CR 4), and subsequent collecting has confirmed the presence of the species among the fossils from the Cape Range. Modern records of *M. macrurus* are unknown from south of the Fortescue River (Ride 1970). The fossil occurrences are located a further 250 km to the south west.

Leporillus apicalis has been recognized from two localities in the Cape Range, indicating a considerable extension of range to that established from modern records. Ride (1970) records the species from Central Australia as far west as the Mann and Musgrave Ranges, South Australia to western New South Wales and parts of Victoria. Lundelius (1957) found it to be abundant in fossil deposits from caves in the Nullarbor region. Other specimens have subsequently been collected by Mr A. Baynes from the surface of small cave deposits in the Shark Bay district (e.g. No. 71.7.5) and from a depth of 2.98 to 3.10 m in Hastings Cave, Jurien Bay district (e.g. No. 72.12.5). In addition, Mr J. White has collected a single specimen of this species (No. 68.1.47) from the surface of a small deposit near Morowa. These fossil records suggest that *L. apicalis* is or was more widely distributed than do the modern records.

One maxilla of a species of *Notomys* from Owl Roost Cave (CR 4) may represent either *N. longicaudatus* or *N. amplus*. The sole record

of *N. longicaudatus* from Western Australia in historic time was from the New Norcia district; other modern records are from the southern part of the Northern Territory and north western New South Wales (Ride 1970). Apart from this uncertain Cape Range specimen, *N. longicaudatus* is not represented in the collections of the Western Australian Museum. Modern *N. amplus* is known only from the vicinity of Charlotte Waters, Northern Territory (Ride 1970) and is not otherwise represented in the collections of the Western Australian Museum.

Zyzomys pedunculatus was collected from four separate localities in the Cape Range and these are at present the only examples of the species in the collection of the Western Australian Museum. Modern records are from the MacDonnell and James Ranges of Central Australia (Ride 1970).

Specimens representing seven individuals of *Pseudomys desertor* were collected from three Cape Range localities. Modern records are from the Canning Stock Route and Bernier Island in Western Australia, from the Northern Territory, South Australia and the vicinity of the Murray and Darling Rivers (Ride 1970). Fossil specimens (e.g. No. 71.10.114) have been collected from Horseshoe Cave (N 59) in the southern Nullarbor region by Mr M. Archer (personal communication, September 1971).

Mr A. Baynes has kindly provided us with the following personal communication (October 1971) concerning other specimens of *Pseudomys* in these deposits.

Pseudomys nanus, which is understood to include *P. ferculinus* following Ride (1970), may be identified with confidence in the Cape Range fossil material and is also found living in the region on Barrow Island. However the identification of the very similar species *P. praeconis* is not as certain. Using characters which have been found to distinguish *P. praeconis* from *P. nanus* from deposits in the Shark Bay district, two Cape Range specimens (Nos. 71.6.92 and 71.6.144) are identifiable as *P. praeconis*. The uncertainty arises because the known modern specimens of *P. nanus* from the north of Western Australia appear to approach the characters of *P. praeconis* in the form of the maxilla, which is used for this identification. Thus, with only a small number of specimens, it is not possible to determine whether the Cape Range *P. nanus* show an anatomical form similar to *P. praeconis* from Shark Bay, or whether, as seems more likely, there are indeed two species represented in the Cape Range material.

Subject to confirmation, the presence of *P. praeconis* in the Cape Range would indicate an extension of range of about 300 km northward from known modern occurrences in the Shark Bay district (Ride 1970). *P. praeconis* has recently been reported from cave deposits in the lower south west of Western Australia, indicating a further substantial extension from the known modern range (Archer and Baynes 1972).

The shark teeth collected from Cave CR 19 are believed to have been derived by erosion

from the marine limestones of Miocene age in which the cave is formed.

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